

AMENDMENTS TO THE SPECIFICATION

Please amend paragraph [0011] beginning on page 5 as follows:

[0011] The present inventors have continued intensive studies focusing their attention on moisture absorptive and desorptive property, particularly moisture absorptive and desorptive rate, of moisture absorptive and desorptive materials. As a result, they paid their attention to the fact that particle size of the moisture absorptive and desorptive materials greatly affects the moisture absorptive and desorptive rate and found that an organic polymer having excellent moisture absorptive and desorptive rate which has not been available yet is now achieved when the particle size is made less than a specific value and when cross-link which prevents the fusion by aggressive force disturbing the expression of surface functions is introduced whereupon they have achieved the present invention.

Thus, the aforementioned object of the present invention is able to be achieved by moisture absorptive and desorptive ultrafine particles which are moisture absorptive and desorptive ultrafine particles consisting of a cross-linked polymer containing 1.0 to 10.0 meq/g of a salt-type carboxyl group and 0.1 to 2.0 meq/g of the sulfonic acid group and/or salt-type sulfonic acid group as ~~a~~-polar groups where an average primary particle size is not more than ~~0-20~~0.1 μm and saturated moisture absorptive ratios at 65% RH and 90% RH at 20°C are not less than 20% by weight and not less than 40% by weight, respectively.

Please amend paragraph [0016] beginning on page 9 as follows:

[0016] The present invention will now be illustrated in detail as hereunder.

Firstly, it is necessary that the moisture absorptive and desorptive ultrafine particles of the present invention contain 1.0 to 10.0 meq/g of a salt-type carboxyl group and 0.1 to 2.0 meq/g of the sulfonic acid group and/or salt-type sulfonic acid group and consist of a cross-linked polymer or, in other words, a polymer having a cross-linking structure. Because of the existence of an appropriate cross-linking structure in the present invention, advantages of a wide surface area property due to the ultrafine particles are effectively utilized. Incidentally, the existence of the cross-linking structure is able to

be confirmed by solubility in water. A salt-type carboxyl group is a polar group having a high hydrophilicity for achieving a moisture absorptive property and, when a high moisture absorptive property is aimed, it is preferred to contain said group as many as possible. However, in order to make both of the moisture absorptive rate and also the moisture absorptive amount high, an appropriate balance in terms of a proportion to the cross-linking structure is necessary. Thus, to be more specific, when the amount of the salt-type carboxyl group is too much, i.e. when it is more than 10.0 meq/g, there are resulted problems that the proportion of the cross-linking structure which is able to be introduced becomes too small and that character of the water absorptive resin becomes strong whereby tackiness is resulted as mentioned already or lowering of the moisture absorptive rate occurs. Thus, an object of the present invention is unable to be achieved. In view of the above, the amount of the salt-type carboxyl group giving a preferred result for the prevention of swelling and making into film is 9.0 meq/g or less.

Please amend paragraph [0035] beginning on page 19 as follows:

[0035] As an essential condition for enhancing the moisture absorptive and desorptive rate in the present invention, it is necessary that an average primary particle size of the moisture absorptive and desorptive ultrafine particles is ~~0.2~~0.1 μm or smaller. The term reading an average primary particle size used here is a mean value of particle sizes in a state where the moisture absorptive and desorptive ultrafine particles are not associated or aggregated (primary particles). When said ultrafine particles are present in a solvent in a finely dispersed state or in a form of emulsion, they are completely dispersed in water and the value measured as an average particles size thereof is used.

Please amend paragraph [0036] beginning on page 20 as follows:

[0036] The case where the particle size is more than ~~0.2~~0.1 μm is not preferred in view of the following two points. (1) Specific surface area becomes small and the absorptive amount on the surface which is the most contributing factor for enhancement of moisture absorptive rate lowers. (2) Since the radius becomes large, time for movement of water molecules to the central part of the particle becomes long. Therefore, water molecules are unable to move to the central part of the particle within very short

time, the central part does not contribute to the moisture absorptive rate and the inherent water absorptive ability is unable to be achieved.

Please amend paragraph [0038] beginning on page 21 as follows:

[0038] ~~There is no particular limitation for the fact that, in the~~The moisture absorptive and desorptive ultrafine particles of the present invention~~[[,]]~~ contain the sulfonic acid group and/or salt-type sulfonic acid group as a polar group which is other than the aforementioned salt-type carboxyl group~~, is also contained therein.~~ In addition, not ~~Not~~ only carboxylic acid group which is not a salt type of course, but also a polar group such as ~~sulfonic acid group, salt-type sulfonic acid group,~~ amino group, phosphoric acid group, salt-type phosphoric acid group, hydroxyl group, nitro group, aldehyde group, amide group, nitrile group and mercapto group may be contained ~~therein together in the~~ moisture absorptive and desorptive ultrafine particles of the present invention. ~~Among them, sulfonic~~Sulfonic acid group and/or salt-type sulfonic acid group (hereinafter, referred to as sulfonic acid/sulfonate group) ~~are/is particularly preferred because they/it~~ contribute(s) in a stable production or presence of moisture absorptive and desorptive ultrafine particles in an aqueous system and ~~are/is~~ highly hydrophilic group(s) which ~~are/is~~ preferred in view of moisture absorptive property as well. Incidentally, the sulfonic acid/sulfonate group mentioned in the present invention includes a mono-substituted sulfate and a salt thereof (-O-SO₃H (or M: salt)).

Please amend paragraph [0039] beginning on page 22 as follows:

[0039] ~~Although there is no particular limitation for the~~The amount of the sulfonic acid/sulfonate group which is contained together with the salt-type carboxyl group~~, the amount is preferred to be~~ 0.1 to 2.0 meq/g. When the amount of said group is less than 0.1 meq/g, ion repulsion by electric charge of the ultrafine particles in an aqueous system becomes small and, therefore, there may be the cases where the ultrafine particles are not prepared and there may also the case where it is difficult that the ultrafine particles are made to be stably present. On the other hand, when the amount of the sulfonic acid/sulfonate group is more than 2.0 meq/g, degree of hydrophilicity as a polymer becomes too high resulting in the same state as the water absorptive resin

whereby there may result in the aforementioned problems. Further, the sulfonic acid/sulfonate group has less moisture absorptive amount per unit weight as compared with a salt-type carboxyl group and, therefore, there is a problem that the salt-type carboxyl group decreases while the sulfonic acid/sulfonate group increases whereby the moisture absorptive ability itself lowers.

Please amend paragraph [0061] beginning on page 33 as follows:

[0061] Examples of the initiator of a thermal decomposition type are a peroxide-type initiator ~~and a persulfate thereof~~ such as benzoyl peroxide, di-tert-butyl peroxide, diisopropyl peroxydicarbonate, 2,4-dichlorobenzoyl peroxide, lauroyl peroxide, cyclohexanone peroxide, tert-butyl perbenzoate, dicumyl peroxide, di-tert-butyl peroxide, p-menthane hydroperoxide, pinan hydroperoxide, cumene hydroperoxide, acetyl peroxide, potassium persulfate and ammonium persulfate; and an azo-type initiator such as azobisisobutyronitrile, methyl azobisisobutyrate, azobis-2,4-dimethylvaleronitrile, azobiscyclohexane carbonitrile, azobisisobutylamidine hydrochloride and 4,4'-azobis-4-cyanovaleric acid.

Please amend paragraph [0078] beginning on page 43 as follows:

[0078] Example 1

400 parts of Acrylonitrile (AN), 40 parts of methyl acrylate (MA), 100 parts of divinylbenzene (DVB), 26 parts of sodium p-styrenesulfonate (SPSS) and 1181 parts of water were charged in a 2000-ml autoclave, then di-tert-butyl peroxide as an initiator for polymerization was added in an amount of 0.5% to the total amount of the monomers and, after being tightly closed, the mixture was polymerized with stirring at 160°C for 10 minutes. After completion of the reaction, the mixture was cooled down to room temperature with a continuous stirring and the polymerized product was taken out from the autoclave. The product was a polyacrylonitrile-type cross-linked polymer in an emulsion form having very fine particle size where an average particle size was 0.06 μm and concentration of the polymer was 27%.

Please amend paragraph [0079] beginning on page 44 as follows:

[0079] To 370 parts of the resulting polyacrylonitrile-type cross-linked polymer in an emulsion form were added 45 parts of potassium hydroxide and 590 parts of water and the reaction was carried out at 95°C for 36 hours whereby nitrile group and methyl ester group were hydrolyzed to convert to carboxylic acid group (potassium salt type at the stage where the hydrolysis reaction was finished). The resulting hydrolyzed solution was placed in a semipermeable membrane of cellulose and dipped in deionized water to desalt to give the moisture absorptive and desorptive ultrafine particles of the present invention in an emulsion form. Characteristics of the resulting moisture absorptive and desorptive ultrafine particles are as shown in Table 1 and the saturated moisture absorptive ratio was so good that it was ~~55~~56% at 20°C × 65% RH and ~~92~~98% at 20°C × 90% RH. It was also confirmed that the two-minute moisture absorptive amount and desorptive amount were as high as 1.4 and 1.5, respectively (high moisture absorptive and desorptive rate).

Please amend paragraph [0086] beginning on page 47 as follows:

[0086] Comparative Example 1

The same method as in Example 1 was conducted except that the hydrolyzing condition was changed to at 70°C for 4 hours to prepare ultrafine particles. Characteristics of the resulting ultrafine particles are shown in Table 12. Since the hydrolyzing condition was mild, content of the carboxylic acid group was very little. As a result, a saturated moisture absorptive ability was low and a two-minute moisture absorptive and desorptive amount was very little whereby the product was unable to be practically used.

Please amend paragraph [0087] beginning on page 48 as follows:

[0087] Comparative Example 2

550 parts of Acrylonitrile (AN), 40 parts of methyl acrylate (MA), 20 parts of divinylbenzene (DVB), 26 parts of sodium p-styrenesulfonate (SPSS) and 1181 parts of water were charged in a 2000-ml autoclave, then di-tert-butyl peroxide as an initiator for polymerization was added in an amount of 0.5% to the total amount of the monomers and,

after being tightly closed, the mixture was polymerized with stirring at 160°C for 10 minutes. After completion of the reaction, the mixture was cooled down to 90°C with a continuous stirring and the polymerized product was taken out from the autoclave. The product was a polyacrylonitrile-type cross-linked polymer in an emulsion form having very fine particle size where an average particle size was 0.05 µm and concentration of the polymer was 29%.

Please amend paragraph [0088] beginning on page 48 as follows:

[0088] To 370 parts of the resulting polyacrylonitrile-type cross-linked polymer in an emulsion form were added 45 parts of sodium hydroxide and 590 parts of water and the reaction was carried out at 95°C for 36 hours whereupon nitrile group and methyl ester group were hydrolyzed to convert to carboxylic acid group (sodium salt type at the stage of completion of the hydrolysis reaction). Since the product obtained after the reaction was in a gel state, 500 parts of water was further added to make into a suspension state of the gel. The resulting product in a suspension state was placed in a semipermeable membrane of cellulose and dipped in deionized water to desalt. Result of the evaluation of the characteristics of the product is as shown in Table 1. Thus, although moisture absorptive property under high humidity was high, a moisture absorptive property at 20°C and 65% RH was low and the two-minute moisture absorptive and desorptive amount was also very little whereby the product was unable to be practically used. In addition, due to its gel state, correct measurement of its average particle size was not possible.